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(56) Documents cited
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GB 1168181
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A4K
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(54) **Liquid applicator**

(57) A device for applying liquid materials to the skin has a poromeric plastic applicator surface 20 comprising a non-flexible, non-deformable, sintered, porous synthetic resin structure having a controlled porosity and having omni-directional interconnecting pores and means to create pressure on the liquid e.g. thin walled portion 40, Fig. 7 or diaphragm 24, Fig. 8.

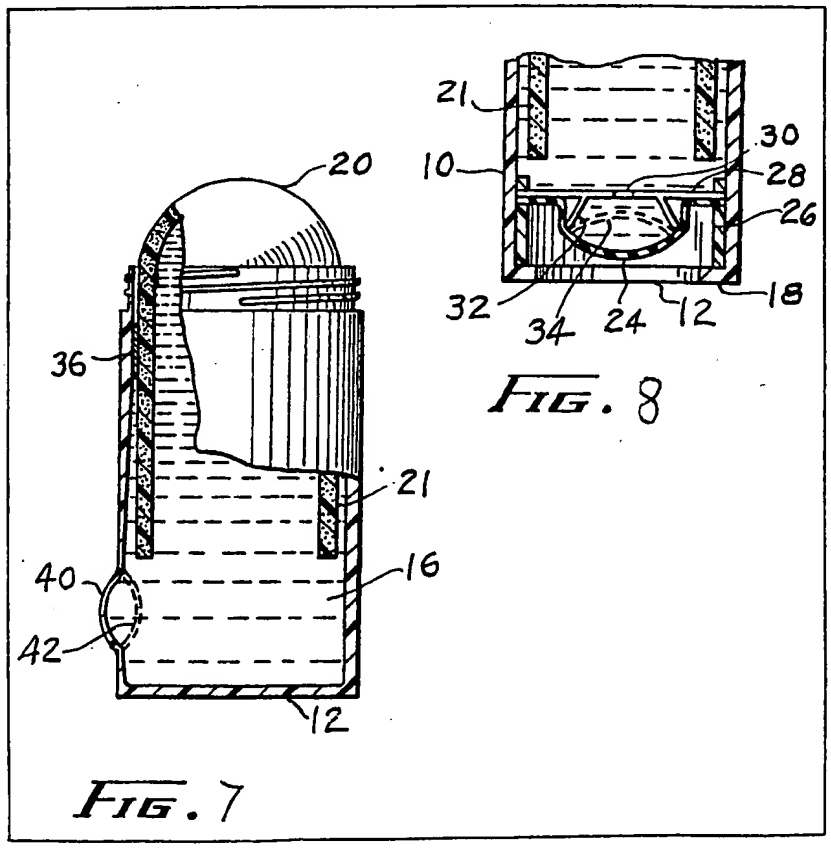

FIG. 7

FIG. 8

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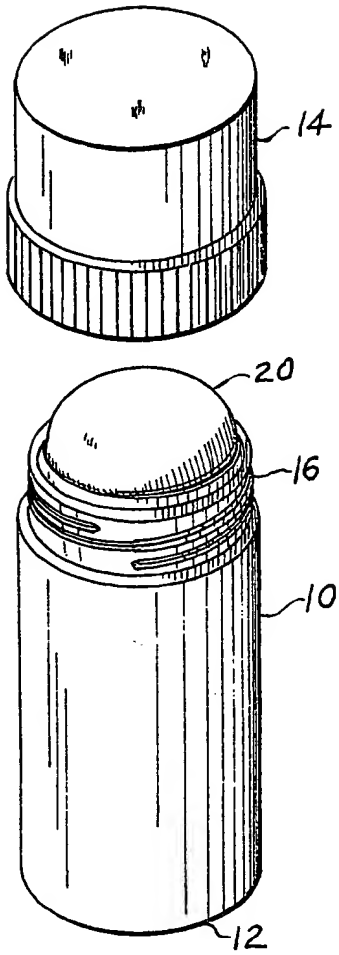

FIG. 1

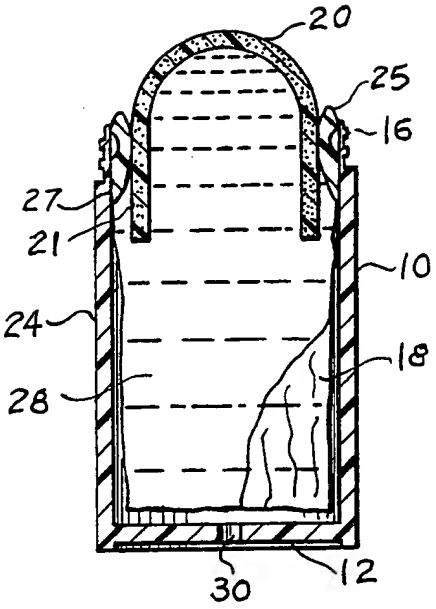

FIG. 2

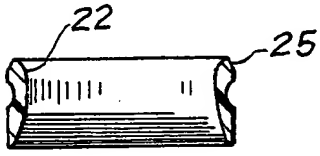

FIG. 3

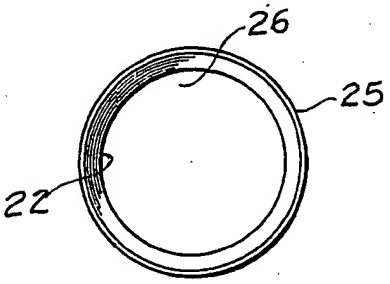

FIG. 4

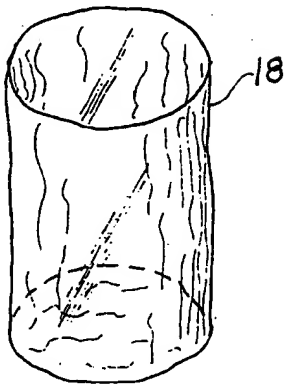

FIG. 5

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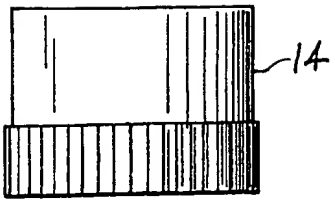


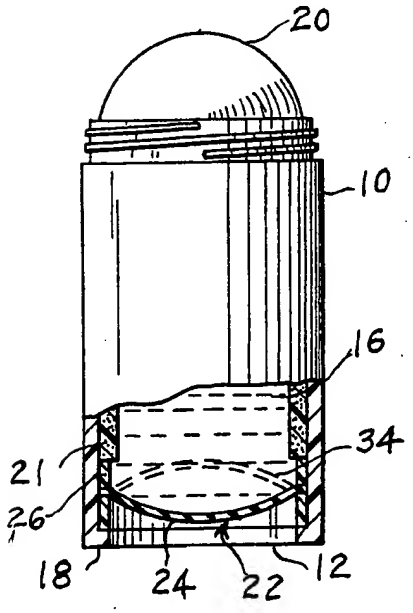


FIG. 6

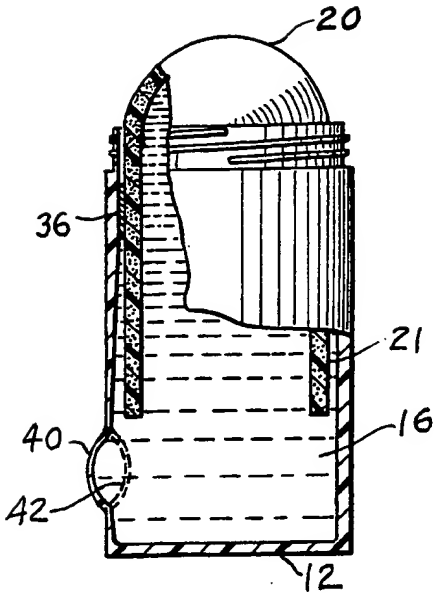
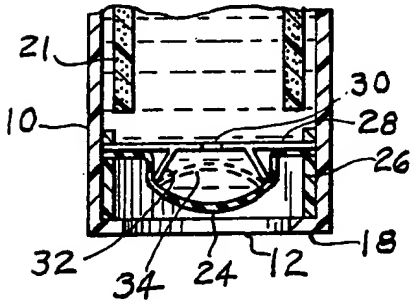


FIG. 7



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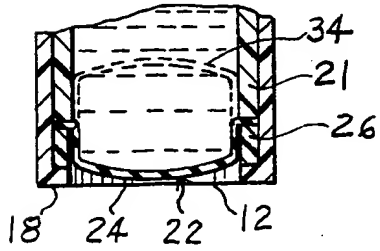

FIG. 9

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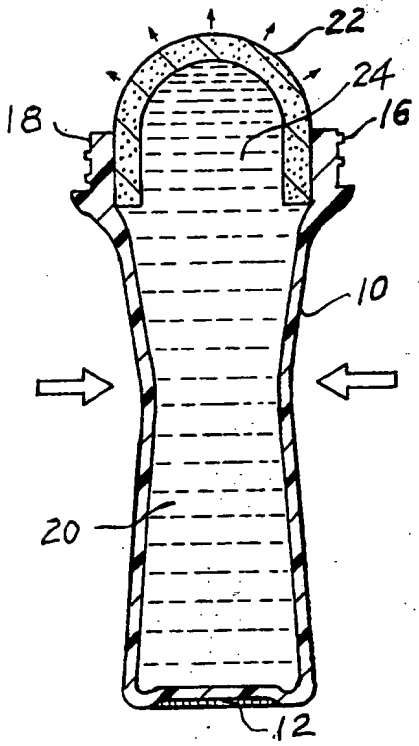

FIG. 11

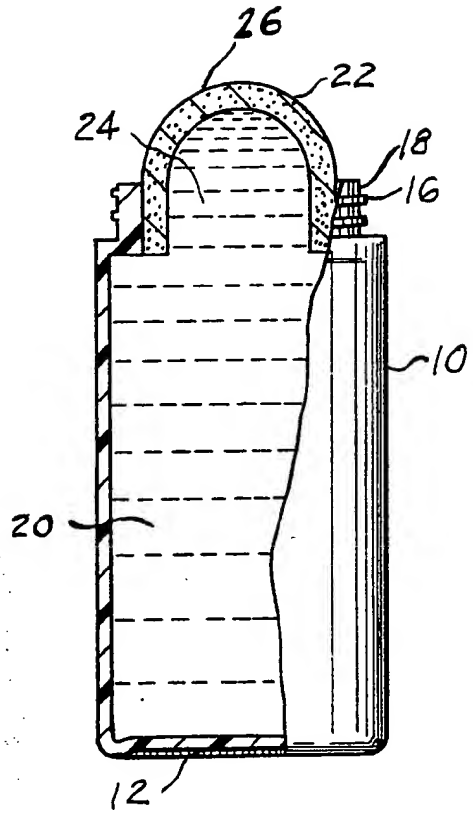

FIG. 10

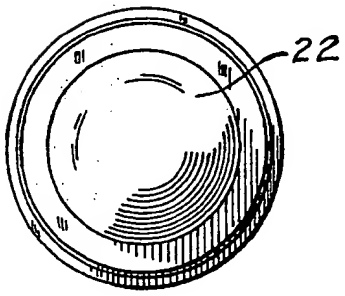

FIG. 13

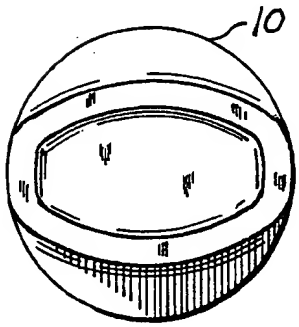

FIG. 12

SPECIFICATION

Liquid deliv ry system for toiletri s and th like

The present invention relates to a liquid applicator for dispensing toiletries to the skin, and particularly for the application of antiperspirants and deodorants to the human axilla.

Liquid applicators in general are well-known in the prior art, particularly the roll-on type commonly for antiperspirants and deodorants. These are disclosed, for example, in U.S. Patents 2,749,566; 2,923,957; and 2,998,616. Because of problems with roll-on type applicators, Berghahn et al., U.S. Patents 4,050,826 and 4,111,567, devised a liquid applicator comprising a container fitted with a head having a fixed, shaped form made of a non-flexible, non-deformable, sintered porous synthetic plastic resin having a controlled porosity and having omni-directional, interconnecting pores. The liquid overflow problems associated with conventional roll-ons is also present with this type of head and is solved by the provision of a liquid collecting channel adjacent the shaped applicator, permitting the excess liquid to drain back via the channel into an opening through the head into the liquid reservoir. This avoids an accumulation of liquid on the surface of the applicator and resulting crystallization of product being delivered.

The porous plastic applicator of Berghahn et al. resembles the conventional roll-on applicator except that it is stationary and has a drain channel. The liquid product being delivered must be brought into contact with the applicator head in order for the liquid to be delivered to the surface by capillary action. This requires inverting the container, resulting in leakage of material in the inverted position.

In copending commonly assigned Application Serial No. 86,225, filed October 18, 1979, is disclosed a delivery system for liquid toiletry products whereby a liquid product is absorbed onto an absorbent material which is in intimate contact with a non-flexible, non-deformable, sintered, porous synthetic plastic resin applicator head having a controlled porosity and omni-directional interconnecting pores, and whereby the absorbed liquid product is continuously delivered to the porous applicator head by capillary flow on demand.

The device has the advantage of eliminating dead air space and the need to invert the container, since the liquid is always in contact with the applicator head and available on demand at the surface of the applicator head.

Although the dispersing device of the copending Application Serial No. 86,225, resulted in a greatly improved control of flow and distribution of product, it was found the flow of product through the porous applicator head by capillary action was still not as great as desirable. This was due to the fact that product is removed from the surface of the applicator head by the user faster than the product it provided from and through the head by capillary flow. It has now been found that this difficulty may be overcome by the use of the present invention which generates internal pressure to supplement capillary action when the porous plastic dispensing head of the container is pressed against the skin.

Thus, the present invention provides a liquid applicator suitable for use in the application of liquids to a surface of the human body, comprising a shaped container adapted for storing a quantity of said liquid, said container having an opening at the upper end thereof; shaped applicator means positioned in said opening and comprising a non-flexible, non-deformable, sintered, porous synthetic resin structure having a controlled porosity and having omni-directional interconnecting pores; and means to create pressure on the liquid within said container.

In one embodiment of the applicator of this invention pressure is created by a reduction of the container internal volume since the liquid is contained in an inner flexible reservoir such as a plastics bag. The container case has an air vent which permits air to enter the case and collapse the reservoir as the liquid contents are withdrawn.

In another embodiment, pressure is created by provision of a flexible area on the exterior of the container. When this flexible area is pressed, fluid is forced out of the pores of the porous applicator head.

In yet another embodiment, pressure is created by the provision of a container formed of a flexibl plastics material which when pressed forces the fluid out of the pores of the porous applicator head.

In the present invention, the applicator head may be of any suitable configuration, but a convex outer surface has been found to be particularly suitable for contact with various parts of the human body. Thus, the applicator head may have a hemispherical shape, either solid or hollow.

The materials which are used to make the shaped applicator head are non-flexible, non-deformable, sintered, porous synthetic resins having a controlled porosity and having omni-directional interconnecting pores, formed of aggregates of united polymer particles. The degree of porosity of the porous materials can be controlled in their manufacture, thus insuring a wide range of porosity to suit a wide range of liquid products of varying viscosities. Sintered, porous applicator heads may be fabricated of high-density polyethylene, low-density polyethylene, ultra-high molecular weight polyethylene, polypropylene, polyvinylidene fluoride, and the like. Products are available commercially under the trade designations "Porex" porous plastics and "Porous Poly." The pore size of the applicator may vary widely, depending on the liquid to be delivered. Low-viscosity liquids, such as perfumes, may best be delivered via a small-pore plastic applicator, e.g., one micron or less. In general, the pore size may vary between about one to 200 microns, and for most purposes, generally about 10—50 microns are preferred.

In a pr ferred embodiment of said one embodiment, the porous applicator head fits into an annular plastic ring which in turn fits into the top opening of the container. The plastic ring also holds an inner flexible bag which forms a reservoir for the liquid material to be dispensed. The container has an air vent to maintain atmospheric pressure within the container and outside the flexible bag. Thus as liquid is withdrawn from the reservoir, the pressure of air entering compresses the flexible bag to conform substantially to the volume of the contents. This aspect of the invention insures continuous contact of the liquid with the applicator head and ease of delivery of the liquid on demand by capillary flow. The flexible bag may be of any suitable material, e.g. polyethylene, polypropylene, saran, or the like.

It will also be obvious that the reservoir could be a shaped plastic cylinder having annular pleats allowing it to collapse under pressure.

The container in this embodiment may obviously be of any suitable material, such as metal, glass, or plastic.

In the embodiment in which a portion of the container has a flexible area, the container can be filled solely with the liquid product. As an alternative, the reservoir may contain an absorbent material, onto which the liquid to be delivered is adsorbed, and this material is in direct and intimate contact with the porous applicator head. This aspect of the invention insures continuous contact of the liquid with the applicator head and ease of delivery of the liquid on demand by capillary flow. The absorbent material used in the reservoir may be any material capable of absorbing the liquid to be delivered, such as cellulose acetate, polyester, cotton, rayon, nylon, or other suitable material, and capable of transferring the liquid therefrom continuously on demand by capillary flow (wicking). The absorbent material may take any suitable shape or form. In one embodiment, the absorbent material is the same non-deformable, non-flexible, sintered, porous synthetic resin material from which the applicator head is constructed. The form may vary, but a particularly advantageous delivery system will consist essentially of a container to hold the contents to be delivered, fitted with the porous head having a cylindrical porous plastic tube extending to the bottom of the container, and having a hemispherical top. The diameter of the cylindrical piece need not be uniform, i.e., the portion extending into the container is of a lesser diameter than the portion extending out of the container in order to fit into the annular plastic spring.

In this embodiment also, the container may obviously be of any suitable material, such as metal, glass or plastics.

The delivery system of the invention may b used to deliver any topical liquid product to the skin. These may include, for exampl , after-shave lotions, pre-shave lotions, skin lubricants or emollients, suntan lotions, fragrances (perfumes, colognes, etc.), topical therapeutics (analgesics, acne formulations, antiseptics, etc.), lip and face rouge and the like. The delivery system is particularly useful in applying antiperspirants and deodorants and avoids the problems associat d with roll-on applicators. Thus, the invention provides a means of applying a low viscosity, fast drying, non-sticky solution of aluminum chlorhydrate, avoiding the undesirable features of roll-ons, pump sprays, and sticks.

Since the porous plastic materials are hydrophobic and do not "wet" with water, it may be necessary to add alcohol to an antiperspirant formula to transfer the product from the container to the applicator head. Crystallization of the solid components of the solution, such as aluminum chlorhydrate, may be avoided by the addition of certain esters, such as isopropyl myristate or isopropyl palmitate.

The invention may be better understood by reference to the drawings in which,

Figure 1 is a perspective view of one embodiment of the liquid delivery system of this invention with the cap of the package removed to show the hemispherical applicator head;

Figure 2 is an elevational view in cross-section to show the applicator head and the flexible bag reservoir;

Figure 5 is a perspective view of the flexible bag reservoir;

Figures 3 and 4 are respectively elevational and top plan views of the annular plastic ring.

Referring to Figures 1—5, the liquid delivery system comprises an outer case 10 having a base 12 and a cap 14 which is attached by means of threads 16 at the top of case 10. It will be understood that cap 14 could be attached by a friction fit also. A porous plastic applicator head 20 is fitted into an annular plastic ring 25 through central opening 26 of ring 25. Applicator head 20 has an inner cylindrical portion 21 which fits into opening 26 and is held by friction fit in annular ridge 22 on the inner surface of ring 25. Flexible plastic bag 18 is held between ring 25 and the inner surface 24 of container 10 at the neck area 27 and forms a fluid tight friction fit to contain liquid product 28 in bag 18. A vent hole 30 is provided in base 12 of container 10 for entry of atmospheric air between the inner surface of container 10 and the outer surface of bag 18. The product 28 is delivered to the surface of head 20 when the head is rubbed against the skin and as the volume of product decreases, air entering hole 30 will collapse flexible bag 18 to conform to the volume of remaining liquid 28 and thus assure even flow through porous head 20. Thus, atmospheric pressure aids in forcing the liquid through head 20, thereby supplementing the capillary flow and assuring an adequate flow of liquid product 28 to the outer surface of head 20.

It will be obvious that other variations of the invention may be made. For xample, flexible plastic bag could be a plastic cylinder having annular pleats to allow collapse under pressure.

Referring now to Figures 6—9:

Figure 6 is an elevational view of an alternative

embodiment of the liquid delivery system with the cap of the package removed to show the hemispherical applicator head, and parts broken away to show the pressure applying means in the base;

Figure 7 is an elevational view with parts broken away to show an alternative pressure applying means;

Figures 8 and 9 are partial elevational views in cross-section with parts broken away to show further alternative pressure applying means.

Referring to the Figures 6, 8, and 9, the liquid delivery system comprises an outer case 10 open at the top and in base area 12. A cap 14 is attached by means of thread 16 at the top of case 10. It will be understood that cap 14 could be attached by a friction fit also. Case 10 contains the liquid product 16 to be dispensed. A porous plastic applicator head 20 is fitted into the top opening of case 10. Applicator head 20 has a cylindrical portion 21 which extends into case 10. As shown in Figures 6 and 8 the porous head 20, may be held in place by a retaining ring 36. As shown, the cylindrical extension 21 is long enough to reach substantially to the base of container, but this could be shorter so long as it fits within the top of container 10. The applicator head is inserted into container 10 by friction fit and forms a fluid tight friction fit in container 10.

Base 12 of case 10 is closed with a flexible diaphragm structure 22 which consists of a diaphragm 24 and retaining ring 26 resting against flange 18 of base 12. In the embodiment of Figure 8, the diaphragm structure 22 also includes a baffle 28 having an opening 30 and a conical structure 32 for maintaining a curvature in diaphragm 24. When diaphragm 24 is pressed for example to the position shown by broken lines 34, a pressure is created within case 10 which expels the liquid contents 38 through the pores of porous head 20, supplementing the capillary flow and assuring an adequate flow of liquid product 38 to the outer surface of head 20. Thus the liquid does not flow through head 20 when the case is inverted, but only when pressure is applied to diaphragm 24. This allows positive control of liquid flow by the user.

In the embodiment shown in Figure 7, case 10 has a closed base 12 a flexible bulb like area 40 on the side of the case. This may be formed by making the case thinner in this area. When bulb 40 is pressed inwardly to the position shown by broken lines 42, an internal pressure is formed, expelling product through head 20, as described above

Referring now to Figures 10—13:

Figure 10 is a front view in elevation of yet another embodiment of the liquid delivery system with the cap removed to show the applicator head;

Figure 11 is a side elevational view in cross-section showing the applicator head and flexible case reservoir;

Figure 12 is a bottom plan view;

Figure 13 is a top plan view.

Referring to the Figures, the liquid delivery system comprises an outer case 10 open at the top, having a base 12 and a cap 14 which is attached by means of threads 16 on neck 18 at the top of case 10. It will be understood that cap 14 could be attached by a friction fit also. Case 10 contains the liquid product 20 to be dispensed. A porous plastic applicator head 22 is fitted into the open end 24 of case 10. In the embodiment shown in the Figures, the applicator head 22 has a hemispherical outer surface 26 and is hollow inside, and fits by friction into neck 18 of case 10. The applicator head 22 may also be a solid hemispherical element. Applicator head 22 may be saturated with the liquid product 20 by pressure on the walls of case 10, but no liquid flows through head 22 by simple inversion of the device. This provides for positive control by the user, and avoids leakage and dripping of liquid.

A variety of liquid products may be dispensed by means of the invention. Illustrative products are set forth in the following specific Examples.

AFTER SHAVE LOTIONS

Example 1 — after shave lotion

	%/Weight
Alcohol (SDA-40 or 39C)	60.00
Propylene Glycol	3.00
Water, deionized	36.00
Fragrance	1.00

Example 2 — after shave lotion (high emollience)

	%/Weight
Alcohol (SDA-40)	75.00
Di-isopropyl Adipate	10.00
Propylene Glycol	5.00
Water, deionized	9.25
Fragrance	0.75

Example 3 — after shave lotion (low alcohol, antiseptic)

	%/Weight
Alcohol (SDA-40)	40.000
Hyamine 10X (Rohm & Haas) methyl benzethonium chloride	0.250
Menthol	0.005
Ethyl p-aminobenzoate	0.025
Water, deionized	59.720
Fragrance	q.s.

PRE-SHAVE LOTIONS

Example 4 — pre-shave (beard softener and lubricant)

	%/Weight
Alcohol (SDA-40)	80.00
Di-isopropyl Adipate	5.00
Menthol	0.05
Propylene Glycol	3.70
Lactic Acid (80%)	0.30
Water, deionized	9.95
Perfum	1.00

Example 5 — pr -shave lotion

	%/Weight
Standamul G (Henkel) (octyl dodecanol)	10.00
Alcohol (SDA-40)	90.00
Perfume, Color, Preservatives	q.s.

Example 6 — pre-electric shave

	%/Weight
Di-isopropyl Adipate	15.00
Alcohol (SDA-40 or 39C)	84.00
Perfume	1.00

Example 7 — pre-electric shave

	%/Weight
Isopropyl Myristate	19.00
Alcohol (SDA-40)	71.00
Water, deionized	10.00
Perfume	q.s.

Example 8 — pre-electric shave (astringent type)

	%/Weight
Zinc Phenolsulfonate	1.00
Alcohol (SDA-40)	40.00
Menthol	0.10
Camphor	0.10
Distilled Witch Hazel Extract	40.00
Water, deionized	18.80

Example 9

	%/Weight
Mineral Oil, 50 cs. visc.	99.5
Perfume	0.5
Color, Preservatives	q.s.

Example 10

	%/Weight
Lantrol AWS (Emery)	10.00
Water, deionized	35.00
Alcohol SDA-40 (95%)	55.00
Perfume	q.s.

SUNTAN LOTIONS

Example 11 — suntan oil

	%/Weight
Isopropyl Isostearate	45.00
Lanolin Oil	2.00
Amyl Dimethyl PABA	1.00
Mineral Oil, 355 cs.	51.90
Propylparaben	0.10

Example 12 — clear hydroalcoholic suntan lotion

	%/Weight
Acetylated Lanolin Alcohol	2.5
Alcohol, SDA-40 (95%)	60.0

Example 13 — clear hydroalcoholic suntan lotion (continued)

	%/W ight
Amyl Dimethyl PABA	2.5
Water, deionized	17.5
Glycerin	10.0
Oleyl Alcohol	7.5

Example 14 — suntan liquid

	%/Weight
Ucon Fluid LB-625 (Union Carbide) PPG-24 Butyl ether	60.775
Alcohol SDA-40 (95%)	30.000
Homomenthyl Salicylate	8.000
Perfume	1.200
Color (1% FD&C Yellow #6)	0.025

Example 15

	%/Weight
Propylene Glycol para Amino Benzoate	4.0
Tween 20 (polyoxyethylene sorbitan monolaurate)	9.0
Alcohol SDA-40 (95%)	45.0
Water	42.0

FRAGRANCE

Example 16 — cologne (men's or ladies)

	%/Weight
Alcohol SDA-40	80—90
Perfume	4— 6
Water, deionized	4—16

Example 17 — emollient cologne

	%/Weight
Alcohol SDA-40	70.5
Water, deionized	19.5
Dipropylene Glycol	5.0
Lantrol AWS (Emery) (PEG-75-Lanolin Oil)	5.0
Perfume	q.s.

TOPICAL THERAPEUTICS

Example 18 — analgesic (for relief of muscular pain)

	%/Weight
Methyl Salicylate	10.00
Oleoresin Capsicum	1.00
Methyl Nicotinate	0.25
Isopropyl Myristate	5.00
Alcohol SDA-40	83.75

Example 19 — acne treatment

	%/Weight
Salicylic Acid	3.00
Boric Acid	2.00
Methyl Benzethonium Chloride	0.08
Isopropyl Alcohol	63.00
Water, deionized	31.92

Example 20

	%/Weight
Aluminum Chlorhydrate (50% aq.)	50.0
Ceraphyl 41 (Van Dyk) (C_{12}—C_{15} Alcohol-lactate ester)	5.0
SD-40 Ethanol (190)	45.0

CLAIMS

1. A liquid applicator suitable for use in the application of liquids to a surface of the human body, comprising a shaped container adapted for

storing a quantity of said liquid, said container having an opening at the upper end thereof; shaped applicator means positioned in said opening and comprising a non-flexible, non-deformable, sintered, porous synthetic resin structure having a controlled porosity and having omni-directional interconnecting pores; and means to create pressure on the liquid within said container.

2. A liquid applicator according to Claim 1, wherein a portion of said container has a flexible area.

3. A liquid applicator according to Claim 1, wherein said container is a flexible plastics material.

4. A liquid applicator according to Claim 1, wherein said liquid is contained within a flexible plastics bag within said container and means is provided to admit air into said container.

5. A liquid applicator according to Claim 1, and substantially as hereinbefore described with reference to Figures 1—5, Figures 6—9 or Figures 10—13 of the accompanying drawings.

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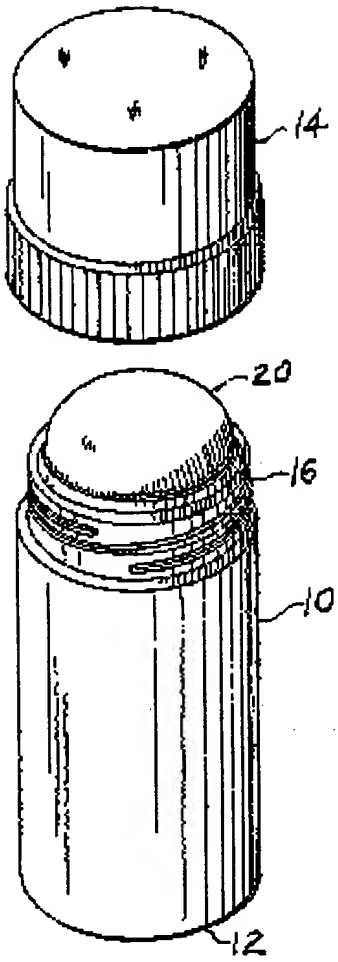

FIG. 1

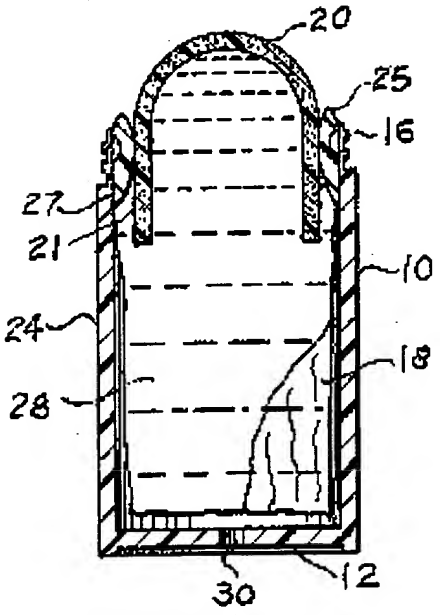

FIG. 2

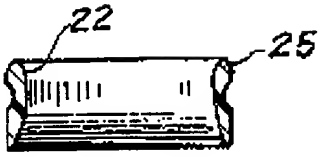

FIG. 3

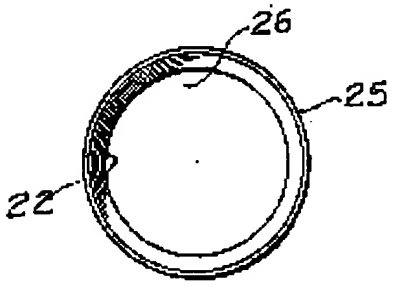

FIG. 4

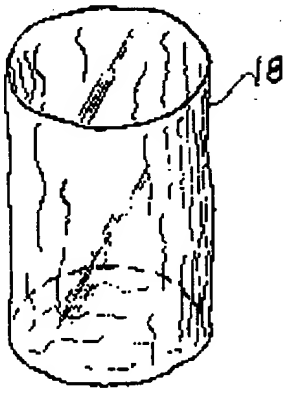

FIG. 5

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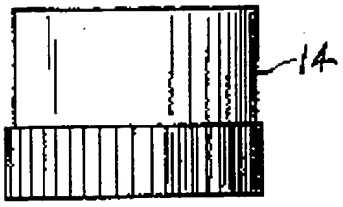

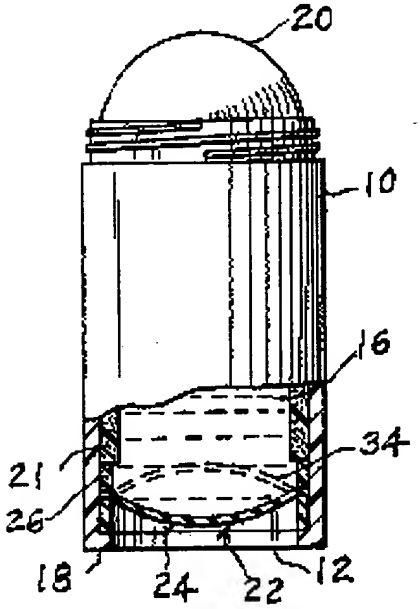

FIG. 6

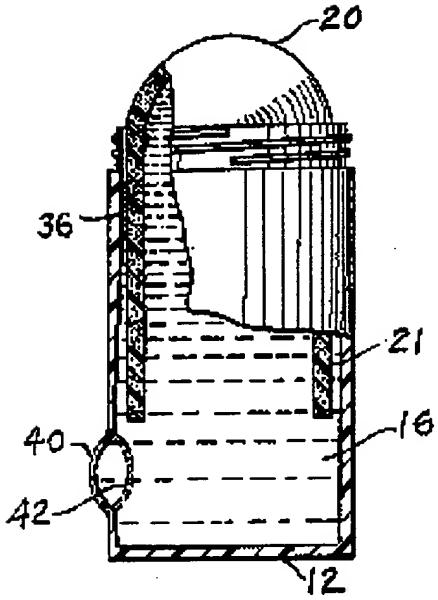

FIG. 7

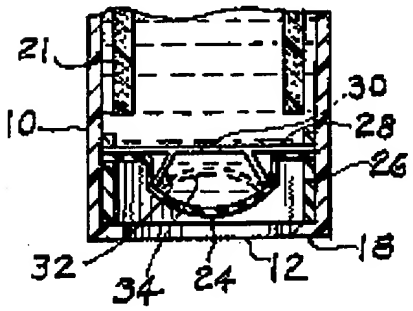

FIG. 8

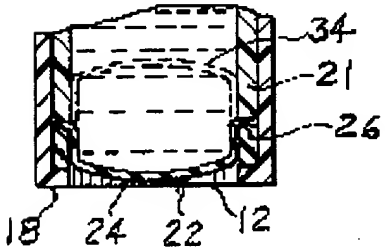

FIG. 9

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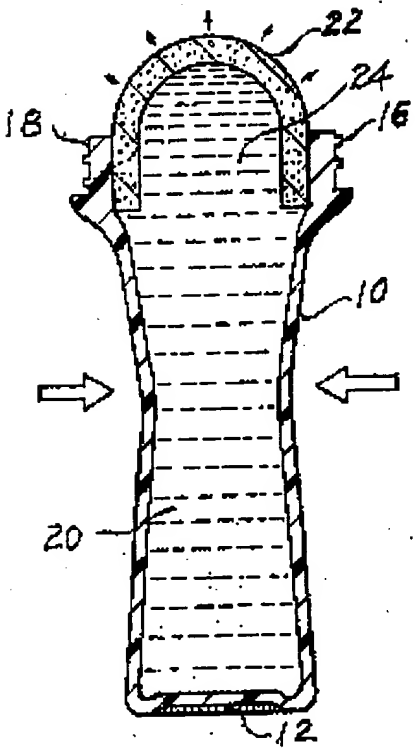

FIG. 11

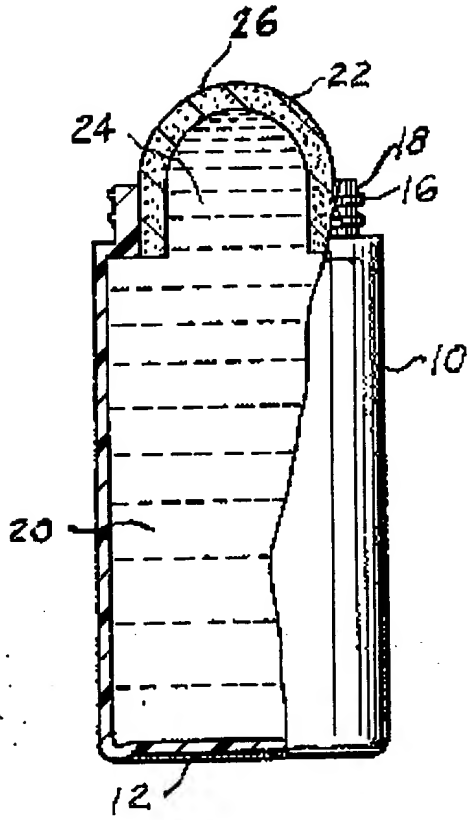

FIG. 10

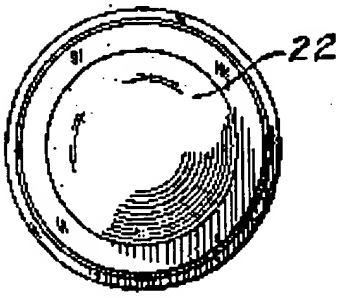

FIG. 13

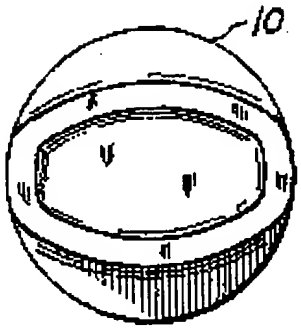

FIG. 12